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Economics of Rabbit Production

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In 1980, Alberta Agriculture conducted a study with three selected rabbitries in the Edmonton area. Production and marketing data were tabulated for two complete cycles. In discussing the economics of rabbit raising the following guidelines will be used based on the average results from 53 out of 60 does:

1. Age of marketable fryers	10.7 weeks
2. Average weight	2.16 kg (4.77 lb)
3. Feed conversion	3.45 kg (3.45 lb)
4. Feed consumption per cycle (doe + litter)	59 kg (130 lb)
5. Average kindling	8.8 fryers
6. Average numbers of fryers marketed	7.3
7. Conception rate	80%

Before attempting to explain the economics of rabbit production some background information and concepts must be presented — especially for the beginner.

Breed-back Systems

The ease with which the rabbit lends itself to increased (theoretical) production frequency, litter size and market price make it a **dreamer's paradise.** The subject of remating systems is very puzzling to the newcomer and if not completely understood leads one down the garden path. Theoretically, a doe could have a litter every 31 days. Since nature protects the species through frequent misses and small litter size, such is not the case.

Some producers remate their does at 21 days after kindling, some at 14 days, some at 28 days, some advocate post partum mating (1 day after kindling) and others remate at 5-6 week intervals.

Table 1 summarizes theoretical production and marketing data for the various breed-back systems, based on the assumption that litters go to market at an average age of 9 weeks.

Table 1. Breed-back Systems

Re-breed / Factor	Post Partum	1 wk	2 wk	3 wk	4 wk	5 wk	6 wk
Gestation (days)	31	31	31	31	31	31	31
Mating systems (days)	1	7	14	21	28	35	42
Total cycle (days) = d	32	38	45	52	59	66	73
Max. no. of litters/yr = A	11.4	9.6	8.1	7.0	6.2	5.5	5.0
Weaning age	25	31	38	45	52	59	66
No. of days each litter spends in fattening cages = B	38	2	25	18	11	4	(-3)
No. of days/year doe's litter spend in fattening cages = A x B = C	433	307	202	126	67	22	(-15)
Fattening cages required/ doe/year = $\frac{C}{365}$ = D	1.19	0.84	0.56	0.35	0.19	0.06	(-0.04)
No. of does that can be housed/100 cages = $\frac{100}{1+D}$ = E	46	54	64	74	84	94	100
Maximum no. of litters/ 100 cages/year	521.4	521.4	521.4	521.4	521.4	521.4	521.4
Maximum no. of litters/ cage/year	5.2	5.2	5.2	5.2	5.2	5.2	5.2

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Table 1 was put together from a very informative article by David Blythe, Asby Farm Rabbits Ltd., England, which appeared in the 1979 Winter edition of Commercial Rabbit. One does not have to understand the mathematics involved — the important thing is the result at the end. With all the various opinions about breed-back systems the beginner always feels that there is the one remating system which produces the maximum number of litters per year and therefore the best financial returns.

In order to simplify Table 1, and as an example, let's suppose a rabbit raiser has enough space in the barn for 100 cages to house does, bucks, fatteners etc. Which remating system is going to get the maximum number of litters per year from the 100 cage unit and what is the maximum number?

Two things which vary with the various remating systems are:

1. The number of does that can be housed in the maximum of 100 cages, leaving enough space for fattening cages and bucks, and
2. the number of days between successive litters.

The example can thus be summarized.

1. Assuming that there are 31 days on average from mating to kindling and if one remates at 14 days, then d will have a value of 31 + 14 = 45 days for the total cycle.
2. The maximum number of litters per doe per year is the number of days per year divided by d. Litters = $\frac{365}{d}$ = A

(Obviously, this assumes that the doe always mates when put to the buck and that she never misses — happy thoughts!)

3. Weaning age is arrived at by assuming each litter is weaned from the doe 7 days before her next litter is due (probably the minimum practical) then each litter will be weaned at an age of d – 7. Thus, if does are remated every 6 weeks, fryers are "weaned" straight to market rather than into a fattening cage, (73 – 7 = 66 days).
4. The number of days each litter spends in fattening cages is arrived at by recalling the assumption of marketing fryers at an average age of 9 weeks (6 days). Thus, the number of days would be 63 + 7 days = 70 days — the total cycle or 70 – d days = B.

For the 6 week remating system 70 – d has a value of 70 – 73 or (-3). This confirms that they don't go into a fattening cage, but straight to market.

5. For each doe, the total number of days her litter spends in a fattening cage each year = (No. of litters) x No. of days litter in fattening cage = A x B = C.
6. Thus, for each doe, the number of fattening cages required would be

   $\frac{C}{365 \text{ days}}$ = D.

   As a passing comment, if one employed a two week breed-back system and had 100 does, theoretically, 56 more fattening cages would have to be installed than if a six week breed-back system was used. Or to put it another way (so goes the argument) 36 less does (100-64) would have to be housed in 100 cages, with 45 cages (64 × 0.56) used as fattening pens as compared to the six week breed-back system of 100 caged does to give one the same number of marketable fryers.
7. The number of does that can be housed in 100 cages, ignoring buck

   $$\frac{100 \text{ cages}}{\text{doe cage + fattening cages}} = \frac{100}{1 + D} = E$$

8. The maximum number of litters per 100 cages will be the (No. of does x No. of litters per doe per year) = E × A = 521.4.

Note: Unless equations are carried through from their fundamental development the reader will not arrive at 521.4 by simply multiplying E x A.

So, what is the conclusion? **REGARDLESS** of which remating system used the maximum number of litters **per cage** per year is 5.2.

Allowing for some cage space for bucks — say 4 bucks per 100 cages. 5 litters per cage space per year whichever remating system is used should be the ideal objective.

Influence of Rebreeding Schedule on Conception Rates

The number of litters per cage space is greatly affected by conception rates. The conception rate from natural matings (aside from the influence of house environment) is also influenced by the choice of rebreeding frequency. The following rates are to be used as a guide and are subject to much seasonal variation depending upon the rabbit raisers' managerial ability, husbandry, experience in breeding rabbits, record keeping program, facilities including temperature and light control, choice, age, and strength of breeding stock, freedom from disease, and feeding program.

	Experienced Breeder			**Beginning Breeder**		
Rebreeding system (days)	P.P	7	14 – 21	25	42	
Conception rate (%)						
Experienced breeder	95	80	92	85	90	80
Beginning breeder	90	70	80	70	85	70

Note: The author of this report has visited Alberta rabbitries where herd conception rates have been as low as 30% owing to poor housing and ventilation, inadequate lighting, disease, poor quality breeding stock, first litter does not conceiving, sterility in bucks because of the summer heat stress, the fall barren period in does caused by decreasing light etc.

Economics of Rabbit Production
Costs, Per Doe, Per Year

VARIABLE COSTS

Feed:	
Doe plus Litter (7.3 fryers/litter) with 5.5 litters 59 kg of feed (130 lb) × 26¢/kg (12¢/lb) × 80% conception	68.65
Bucks 54 kg (120 lb) ÷ 8 Does/Buck × 26¢/kg (12¢/lb)	1.80
Sub Total Feed	$ 70.45
Doe Depreciation $\frac{(\$16\text{-}4) \times 5 \text{ litters/year}}{15 \text{ litters}}$	4.00
Buck Depreciation $\frac{(\$22\text{-}4)}{2 \text{ years} \times 8 \text{ does/buck}}$	1.13
Operating Costs 22¢ /kg (10 /lb) fryers marketed x 80%	15.32
Sub Total Other Costs	$ 20.45
Total Variable Costs/Doe/Year	$ 90.90

FIXED COSTS

Building – Doe Inventory	48.67
Building – Replacement Doe and Buck Inventory	9.25
Equipment – Doe Inventory	4.42
Equipment – Replacement Doe and Buck Inventory	1.77
Interest on Livestock and Feed $12\% \times \frac{12}{2}$ Doe $+ \frac{18}{2 \times 8}$ Buck $+ 18\% \times \frac{70.45}{2}$	7.20
Total Fixed Costs/Doe/Year	$ 71.31
Total Cost/Doe/Year	$162.21

RECEIPTS

Sale of Fryers – (5.5 litters/yr × 7.3 fryers/litter) x 2.16 kg/fryer (4.77 lb) × 1.65/kg (75¢ lb) × 80%	$114.90
Return to labor, Capital and Management (114.90 – 90.90)	$ 24.00
Return to Management and Labor (114.90 – 90.90 – 71.31)	$(-47.31)

Economics of Rabbit Production
Costs Per Doe Per Year

VARIABLE COSTS

Feed:

It is assumed that an 18% protein pellet is fed along with alfalfa cubes at a cost of 26 cents per kg (12¢/lb). Bucks can be fed a lower protein ration of 15%. This is a good management practice but usually in small rabbitries only one feed is purchased and the amount given to bucks rationed daily. Feed consumption of nonproductive does should also be restricted.

A conception rate of 80% is further assumed along with a 5 week breed-back system, giving a theoretical number of litters per year of 4.4. Under Alberta conditions a beginning rabbit raiser with ideal conditions would be fortunate if an average of 70% was obtained during the first few years.

A feed consumption of 59 kg (130 lb) for the doe plus 7.3 fryers marketed may seem quite high but in the Alberta study it took on the average 10.7 weeks to market a 2.16 kg fryer (4.77 lb). If the reader so wishes, a feed consumption of 41 kg (90 lb) at an 8 week market age and average fryer weight of 1.63 kg (3.59 lb) may be used. As a passing comment, under Alberta conditions it was more profitable for a producer to market a heavier fryer since when a regression analysis was done marginal profit was still above the average profit until approximately 11 weeks for the average of 53 does. Some crosses, of course were ready between 9-10 weeks.

Other economic models have charged 68 kg (150 lb) of feed against the doe per year and 7 kg (15 lb) against the litter with 7 fryers per litter marketed at an average weight of 2.27 kg (5 lb).

Furthermore, in our model litter mortality is considered at approximately 15%, for example, average kindling of 8.8 kits with 7.3 being marketed.

Doe and Buck Depreciation:

The feeding cost of replacements is not calculated in the economic model since the doe and buck are depreciated on an annual basis. It is assumed that on a six week breed-back system a good doe should remain in condition for approximately three years or produce 5 litters.

However, in reality this may not be always the case, but assumptions have to be made with the economic model used as only a guideline for further scrutiny by the reader. Some operators on a two week breed-back system replace at least 50% of their does annually, thus the formula would change and depreciate at a faster rate.

The initial value of the doe and buck are approximate, but are fair costs in Alberta for a rabbit six months of age. The salvage value of $4.00 is based on a 4.5 kg (10 lb) animal worth 88¢/kg (40 cents a pound).

One problem in expanding too quickly should be mentioned at this point. That is, a negative cash flow is usually generated for approximately three years if a producer is raising his/her own replacement stock, and expands let us say from 50 to 350 does. One-half of the litter are usually does and the saving of females means fewer animals from the litter are sold as fryers. Plus, during expansion the feed conversion for the entire rabbitry may be as high as 10 to 1 instead of approximately 4.5 lb of feed to 1 lb of gain, (as well as with metric in kilograms) for the entire rabbitry in northern climates. Invariably, during rapid expansion, operating capital becomes the limiting factor. The beginner in desperation to make more money saves all the "junk" for breeding stock, with no selection pressure whatsoever. Eventually he throws up his arms in disgust and quits with the feed salesman pounding at the door.

Mortality in breeding stock is not considered in the model, however, it usually runs from 10% to 15% per year.

Operating Costs:

Many rabbit raisers do not think about operating cost, however, they are a cost of production. From a study done in British Columbia the following operating costs were calculated.

	Cost per Fryer kg	lb
Medicine and veterinary supplies	.022	.01
Hay and operating supplies	.022	.01
Utilities	.070	.03
Transportation and shipping	.090	.04
Administration and misc.	.012	.01
	$0.22	$0.10

The above figures may not apply to your particular situation but in most cases operating costs usually run around 20% of total feed costs per year.

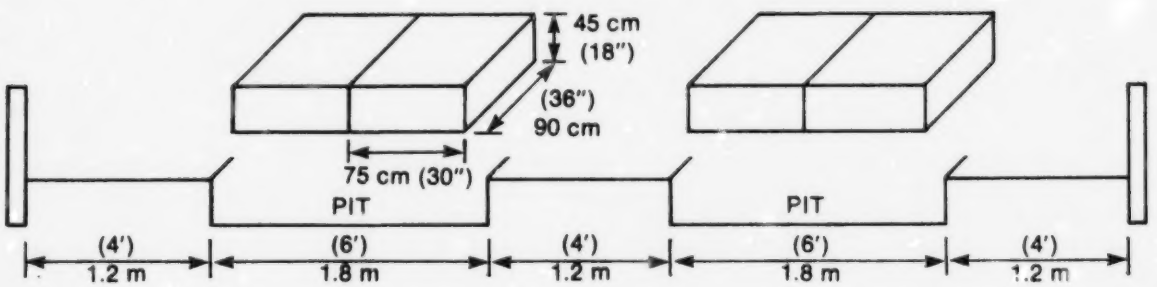
FIXED COSTS

If it weren't for housing costs one could make money raising rabbits in Alberta. In California, where a plywood roof over the cages is all that is really required, building costs are cheap.

Cage Layout:

The basic cage is 90 cm x 75 cm x 45 cm (36" long x 30" deep x 18" high). In our example the building is 7.3 metres wide (24').

This end view of the cages shows 2 back to back centre cage rows hung from the ceiling 75 cm (30") above the cement walkways. The cages are 30 cm deep (2.5'), the aisles approximately 1.2 m wide (4') with gravel pits 1.8 m wide (6'). A wider pit prevents the rabbits urinating onto the aisles.



Area in a Cross Section of a Rabbit Building:

In order to better understand the total area required, the following table indicates the amount of space utilized by one doe and her family.

Cage Depth x Front cm (ft)	No. Cages	Total Cage area m^2 (ft^2)*	Building Width m (ft)	m^2 (ft^2)**	Total Floor Area/Doe m^2 (ft^2)***
Does 75 x 90 (2.5 x 3)	4	2.8 (30)	7.3 (24)	6.7 (72)	1.7 (18)
Rep. or Bucks 75 x 45 (2.5 x 1.5)	4	1.4 (15)	7.3 (24)	3.3 (36)	0.8 (9)

* Width x Length x No. of cages
** Building Width x Length of cages
*** Area ÷ No. of cages

Single-Tier Cages:

A single-tier rabbit cage 90 cm x 75 cm x 45 cm (36 in. x 30 in. x 18 in.) occupies 0.70 m^2 (7.5 ft^2). Walkways add another 0.98 m^2/doe (10.5 ft^2). If 3 metres (10 feet) of the building are utilized at both ends for the turning of equipment, and a utility room for feed and office equipment is installed, the floor space per doe in an average single-tier rabbitry amounts to approximately 1.86 m^2/doe (20 ft^2).

In a completely environmentally-controlled building, construction costs (excluding labor) at the present time in Alberta for a 100 doe rabbitry amount to $162 per m^2 ($15.00 per ft^2) depending upon the size of building. A larger building is cheaper to build per square metre of floor space. A shed can be constructed quite cheaply, but for year round fryer production it will not be suitable. The cost of constructing a good insulated building, therefore, should be carefully designed and estimated prior to construction.

In studying other economic models, building costs per doe are substantially lower. That is because double-tier or triple-tier cages are considered instead of only a single-tier. The single-tier cage system is the best for the health of the rabbits; ease of ventilation for humidity and temperature control, and of course in the reduction of labor.

Rabbitries especially with triple-decked cages have nothing but trouble with disease, owing to inadequate ventilation, difficulty with cleaning and high ammonia levels. The single-tier with cement walkways and gravel bottomed pits with drain tiles is the best system — but very costly. An older renovated building utilizing single-tier cages seems to be the only way a commercial rabbit raiser in a northern climate can hope to make the raising of rabbits profitable.

Monthly Payments Per $1,000:

The following gives the constant level payments to amortize a loan with interest and principal included:

Interest	1 year	5 years	10 years	15 years	20 years
12%	93.33	22.25	14.35	12.01	11.02
16%	96.67	24.05	16.44	14.34	13.54
18%	98.33	25.05	17.61	15.65	14.95
20%	100.00	26.06	18.81	16.99	16.38

Housing and Equipment Cost Per Doe

Caging costs can vary from $13.00 homemade to $22.00 purchased. Basic cage equipment (feeders, waterers, nest boxes) adds an additional $10.00 per cage (feeders, automatic waterers, nest boxes). The economic model assumes a homemade cage plus equipment at a cost of $23.00.

If one invests money from savings, interest on the investment would have to charged against the rabbitry because this money would earn interest if it were in the bank. The model for the sake of simplicity **assumes all the money is borrowed at 12% interest.** In order to borrow at 12% interest some type of subsidized government loan is necessary.

The longer one can depreciate buildings and equipment the easier it will be to pay off any type of loan. Money at 20% interest rate is just out of the question for anyone wishing to borrow money to raise rabbits. The following table compares the two rates of interest for varying rates of depreciation for the annual cost per doe per year for housing and cages.

	Building		Cages	
Depreciation	12%	20%	12%	20%
20 years	57.92	87.00	–	–
10 years	–	98.20	6.20	7.91
5 years	–	–	–	10.70

The foregoing includes a 0.5% charge per year of the initial cost for repairs, a 1% charge for insurance and 1.5% charge for taxes on buildings.

Therefore, using the imperial system building cost per doe at $15.00 per ft^2 equals ($15.00 x 20) $300.00, excluding land. Amortized over 20 years this amounts to (11.02 x $\frac{300}{1000}$ x 12) $39.67 per doe or $3.31 per doe per month.

Adding the costs for repairs — 0.5%, insurance — 1%, taxes — 1.5%, adds an additional $9.00/doe/year (300 x 3%) for a total building cost of $48.67 per doe per year or $4.06 per month.

Further housing charges against the doe are replacement stock and bucks. Of course it is assumed these cages are smaller (18" x 30" x 18"). Since the cost of the doe was depreciated over 3 years and the buck 2 years for an average replacement of 2.5 years, housing cost for replacement does and bucks becomes $\$57\left(\frac{\$15.00 \times 9.5 \text{ ft}^2}{2.5 \text{ years}}\right)$

Amortized over 20 years amounts to (11.02 x $\frac{57.00}{1000}$ x 12) $7.54 per doe or $10.63 per month. Adding the costs for repairs — 0.5%, insurance — 1%, and taxes — 1.5% equals (57.00 x 3%) $1.71/doe/year for a total of $9.25 per year or $0.77 per doe per month. Thus, total building costs/doe year (48.67 + 9.25) = $57.92. Broken down, depreciation amounts to $17.85 per doe and interest plus miscellaneous fixed costs $40.07 per doe.

In considering cost per doe per year for cages, a homemade cage is assumed at a cost of $23.00. Amortized over only 10 years this amounts to (14.35 x $\frac{23}{1000}$ x 12) $3.96 per doe per year or $0.33/month. Adding 1% for repairs and another 1% for insurance ($23.00 x 2%) amounts to $0.46/doe/year for a total cage cost of $4.42/doe/year or $0.37 per month.

Cages for replacement stock plus bucks is figured to be $\frac{\$11.50 \times 2}{2.5}$ = $9.20 per doe.

Amortized over 10 years ($14.35 \times \frac{9.20}{1000} \times 12$) equals $1.59 per doe or $0.13 per month adding additional costs for repairs and insurance amounts to (9.20 x 2%) $0.18 per doe per year for a total cost of $1.77 /doe. Thus, total cage cost/doe/year becomes (4.42 + 1.77) $6.19. Broken down depreciation amounts to $2.30 and interest plus miscellaneous fixed costs — $3.89 per doe per year.

The following table summarizes the calculations.

Housing and Equipment Costs Per Doe:

		$ Per Year	$ Per Month
Building — Depreciated @ 5% per year — 20 years			
Doe — $\frac{11.02 \times 300 \times 12}{1000}$		39.67	3.31
— 300.00 x 3%		9.00	0.75
	Sub Total	48.67	4.06
Replacements plus Bucks			
— $\frac{11.02 \times 57.00 \times 12}{1000}$		7.54	0.63
— 57.00 x 3%		1.71	0.14
	Sub Total	9.25	0.77
	Total	57.92	4.83
Depreciation — $17.85/yr; Interest plus Misc. Costs — $40.07/yr			
Equipment — Depreciated @ 10% per year — 10 years			
Doe — $\frac{14.35 \times 23.00 \times 12}{1000}$		3.96	0.33
— 23.00 x 2%		0.46	0.04
	Sub Total	4.32	0.37
Replacements plus Bucks			
— $\frac{14.35 \times 9.20 \times 12}{1000}$		1.59	0.13
— 9.20 x 2%		0.18	0.02
	Sub Total	1.77	0.15
	Total	6.19	0.52
Depreciation — $2.30/yr; Interest plus Misc. Costs — $3.89/yr.			

If a two-tier or a three-tier cage is used housing costs per doe, theoretically, can be divided by two or three respectively. Cage costs initially, would increase approximately $10.00 per doe for a three-tier system.

Interest on Livestock and Feed:

The model assumes breeding stock is mature when purchased and money cost 12%. However, feed would have to be purchased at an interest rate of approximately 18% if one did not have enough capital. The cost of feed is divided by two since it is assumed one-half of it is financed on average.

RECEIPTS

The return to labor, capital and management of $24 is slightly high for fryer production under Alberta conditions. It should be recalled that a heavier fryer is being marketed and the calculations used assume 22 fryers per doe per year (5.5 x 7.3 x 80%). None are saved for replacement since in the model breeding stock is depreciated on an annual basis.

Various labor chores are estimated at 10 hours per doe per year. At this rate an operator receives $2.40 per hour per doe for return to labor, capital and management. If one excludes operating costs an additional $10.45 per doe is theoretically realised.

Nevertheless, when fixed costs are considered a loss of $47.31 per doe per year is realized in this particular economic model. Juggling the figures makes for a lot of fun, but in the end the message is clear — beware of fixed costs and use realistic production and marketing goals. Start small, build your herd slowly, if possible utilizing an older building and homemade cages, and remember that presently the raising of rabbits for profit should be only considerd a supplementary income to regular employment.

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